Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

# NIA Project Registration and PEA Document

### Date of Submission

Dec 2013

### Project Reference Number

UKPNT204

## Project Registration

### Project Title

Flexible Urban Networks - Low Voltage

### Project Reference Number

UKPNT204

### Project Licensee(s)

UK Power Networks

### Project Start

January 2014

### Project Duration

3 years and 0 months

### Nominated Project Contact(s)

UKPN Innovation Team

### Project Budget

£8,867,000.00

### Summary

Efforts to decarbonise energy generation and heat and transport will place increasing demands on distribution networks, particularly so for the low voltage (LV) networks closest to our customers, where DNOs have the obligation of supplying customers their electricity demand, within tightly defined voltage limits which their consumer electronics have been designed to expect, and at a sufficient quality (harmonics, sags, swells and flicker). Analysis carried out by Imperial College to support our RIIO-ED1 business plan predicted an increasing trend of voltage issues and demand rises that could overload transformers and underground cables, requiring £132.6m of network reinforcement during the RIIO-ED1 period if reinforced by conventional means.

Meshed networks offer one potential part of the answer. In meshed networks, customers are supplied by two or more different routes through the LV network, with the result that their demand can be shared across substations reducing heavily loaded transformers, voltage fluctuations tend to be suppressed, losses are reduced, and customers benefit from in-built resilience to high voltage (HV) network faults. The Smart Grid Forum identified meshed networks as a significant component of a smart network. UK Power Networks has run some parts of its networks meshed for many years. In urban and central business districts, there is potential for further meshing.

Power electronics devices will be used for the first time, in combination with remote configuration and informational tools, to access latent/spare capacity that already exists, in shorter timescales than conventional reinforcement. This solution allows a faster response to LV demand changes and higher utilisation of existing assets. Should reinforcement be required in the future, the equipment can be redeployed. The increased visibility will also aid the effectiveness of network planning. The project is expected to demonstrate headline savings of £2.36m across 36 trial sites, whilst importantly providing greater flexibility, faster connections and reducing the risk of long interruptions due to HV faults. We estimate that these can scale up to a saving of £112.8m on a rigorous discounted cashflow basis releasing up to 162 MW in shared capacity in the latter half of ED1 and ED2 across the whole of GB.

### Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

## Problem Being Solved

## Method(s)

## Scope

## Objective(s)

The three core objectives are to:

- Optimise capacity on the low voltage (LV) network closest to customers to accommodate the forecasted growth in electric vehicle charging, heat pumps and micro-generation on existing connections by making the network more flexible and resilient through capacity sharing between substations.

- Improve connection offers (time & cost) in urban areas by knowing where best to connect, and by managing voltage, power flows and fault current through the use of power electronics.

- Advance the future network architecture debate for the sector by evaluation and learning dissemination in terms of financial learning, benefits and architecture of the power electronics applications on different network architectures and by providing network configuration control in combination with remote switching.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

n/a

## Project Partners and External Funding

n/a

## Potential for New Learning

n/a

## Scale of Project

n/a

## Geographical Area

## Revenue Allowed for the RIIO Settlement

## Indicative Total NIA Project Expenditure

# Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

## Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

## How the Project has the potential to facilitate the energy system transition:

n/a

## How the Project has potential to benefit consumer in vulnerable situations:

n/a

## Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

## Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

n/a

## Please provide a calculation of the expected benefits the Solution

n/a

## Please provide an estimate of how replicable the Method is across GB

n/a

## Please provide an outline of the costs of rolling out the Method across GB.

n/a

## Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☐ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is

unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

### Specific Requirements 4 / 2a

### Please explain how the learning that will be generated could be used by the relevant Network Licensees

n/a

### Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

n/a

☐ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

### Is the default IPR position being applied?

☐ Yes

### Please demonstrate how the learning from the project can be successfully disseminated to Network Licensees and other interested parties.

### Please describe how many potential constraints or costs caused, or resulting from the imposed IPR arrangements.<

### Please justify why the proposed IPR arrangements provide value for money for customers.

## Project Eligibility Assessment Part 2

### Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

### Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

n/a

### If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

## Additional Governance And Document Upload

### Please identify why the project is innovative and has not been tried before

n/a

### Relevant Foreground IPR

n/a

### Data Access Details

n/a

## Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

n/a

## Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

n/a

## This project has been approved by a senior member of staff

☑ Yes